Name: _____

Pre-class Assessment 2

MA 220

1. (a) Use differentiation to determine an extremum of the function

$$f(x) = \begin{cases} 10x^2 + 5x + 1 & : x \in (-10, 10) \\ 0 & : \text{ otherwise} \end{cases}$$

(b) Is the extrema you found in the previous part a maximum or a minimum of f?

(c) What is the value of f at this point?

(d) What are the other extrema of f? **Hint:** Calculus will not help here.

2. Compute the first derivatives with respect to x of the following functions:
   (a) $g(x) = e^x$

   (b) $h(x) = e^{-x^2}$

3. Evaluate the following definite integrals:
   (a) $\int_a^b \frac{1}{b-a}\,dx$ where a and b are constants

   (b) $\int_0^2 4x - 2x^2\,dx$

   (c) $\int_0^\infty ce^{-cx}\,dx$ where c is a positive constant

   (d) $\int_0^\infty xe^{-x}\,dx$

4. What is the power series expansion (aka, Taylor series) of e^x? What is its radius of convergence?

5. Expand $(a+b)^k$, where $k \in \mathbb{N}$, using the Binomial Theorem. Your answer should be in summation notation, *i.e.* in the form

$$(a+b)^k = \sum_{n=?}^{?} ?$$

6. How does $e^x e^y$ simplify?

7. Prove De Morgan's Laws. You may use a Venn Diagram in your proof.

   Reminder: $\cup$ denotes union, $\cap$ denotes intersection, and $'$ denotes complement.

   (a) $(A \cup B)' = A' \cap B'$

   (b) $(A \cap B)' = A' \cup B'$